

**ATMOSPHERIC FORCING ISSUES
NEAR LAND/SEA BOUNDARIES**

By

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Introduction and Motivation

- “Coarse” resolution atmospheric forcing:
 - ECMWF ($1.125^\circ \times 1.125^\circ$)
 - NCEP ($1.875^\circ \times 1.875^\circ$)
 - NOGAPS ($1.0^\circ \times 1.0^\circ$)
- “Fine” resolution HYCOM
 - $1/12^\circ$ Pacific model
 - $1/25^\circ$ Black Sea model
 - $1/37.5^\circ$ Gulf of California

- PROBLEM

Coarse resolution atmospheric products
in forcing much finer OGCMs, such as HYCOM

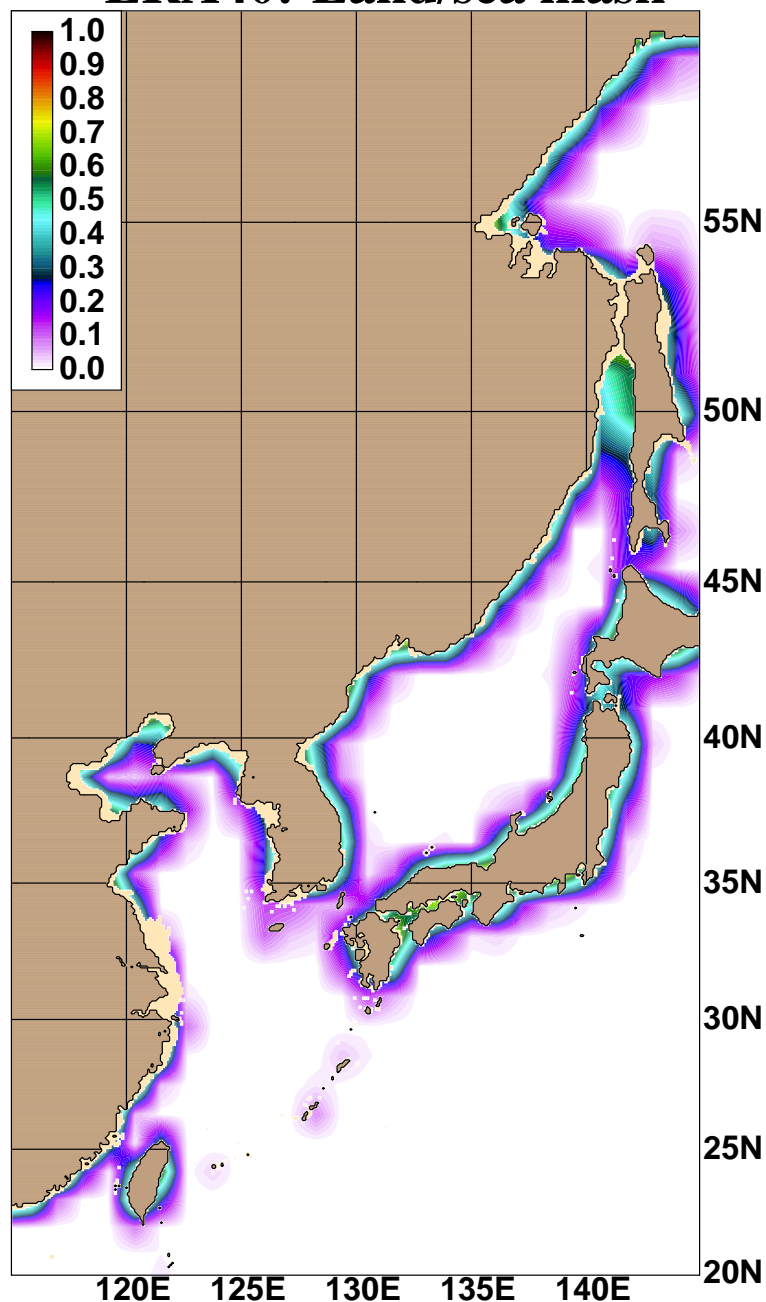
Specific Issues

- Interpolation to HYCOM domain
- Land/sea boundary near the coastal regions:
 - atmospheric forcing contaminated by land values
 - ocean grid misrepresentation near the coast
- HYCOM needs **only over-ocean** atmospheric condition

Land/Sea Mask

- Model surfaces are divided into sea (0) and land (1) point
- Land: if more than 50% of the grid box is on the land

ERA40: Land/sea mask

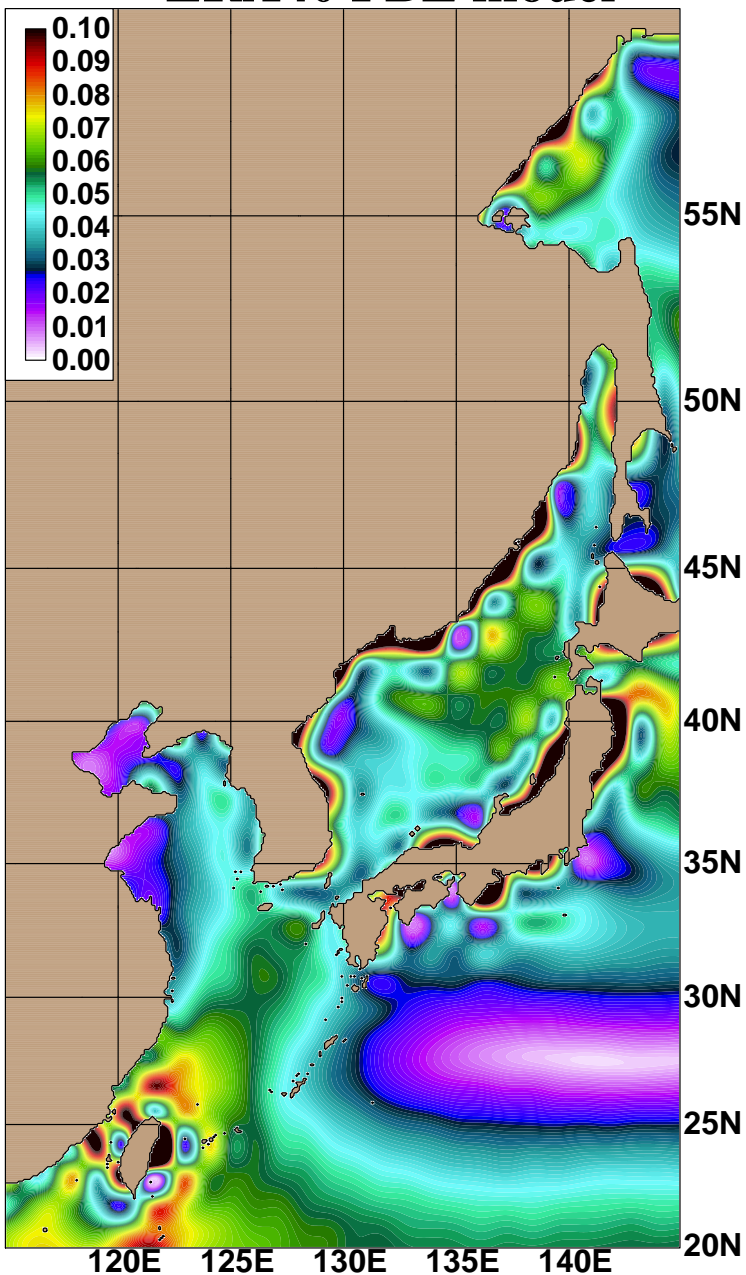


Wind Forcing

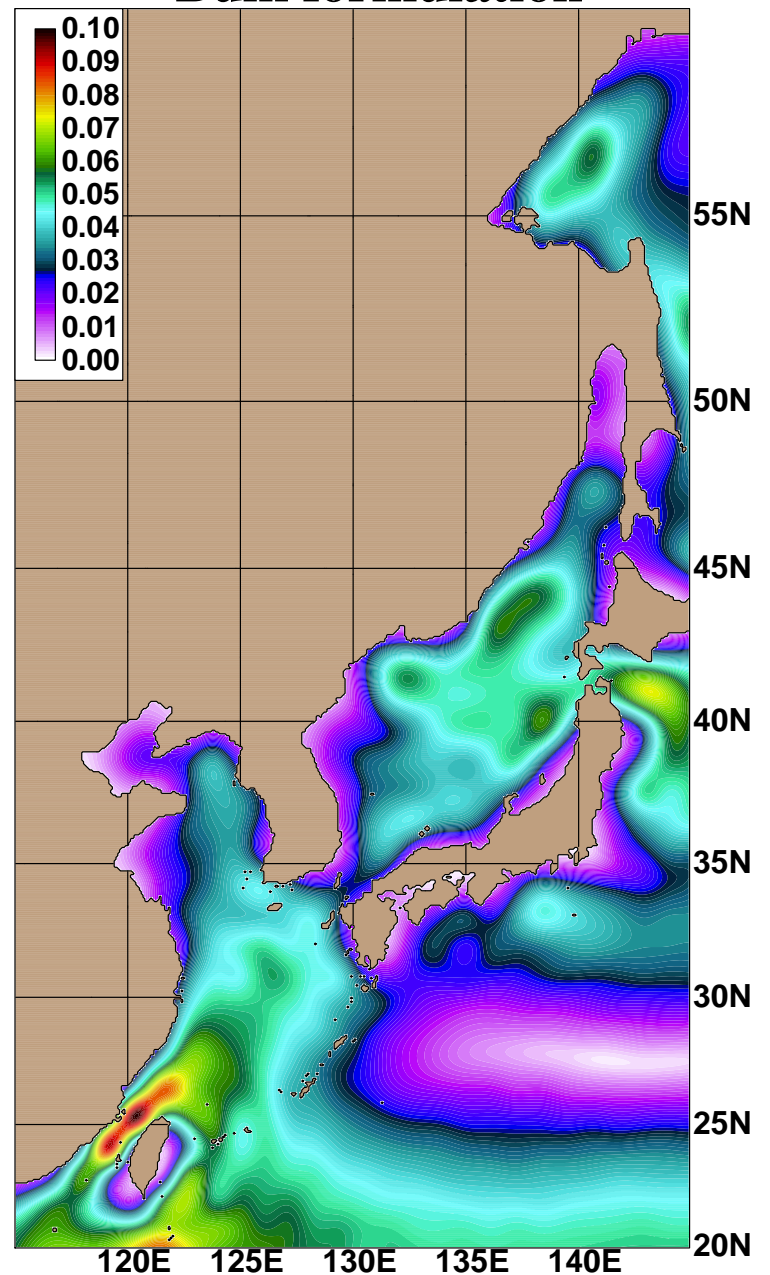
- Elimination of excessive noise and incorrect data
- Use bulk formulation with ERA40 wind speed

WIND STRESS MAGNITUDE (N m^{-2}): 1979–93 mean

ERA40 PBL model



Bulk formulation

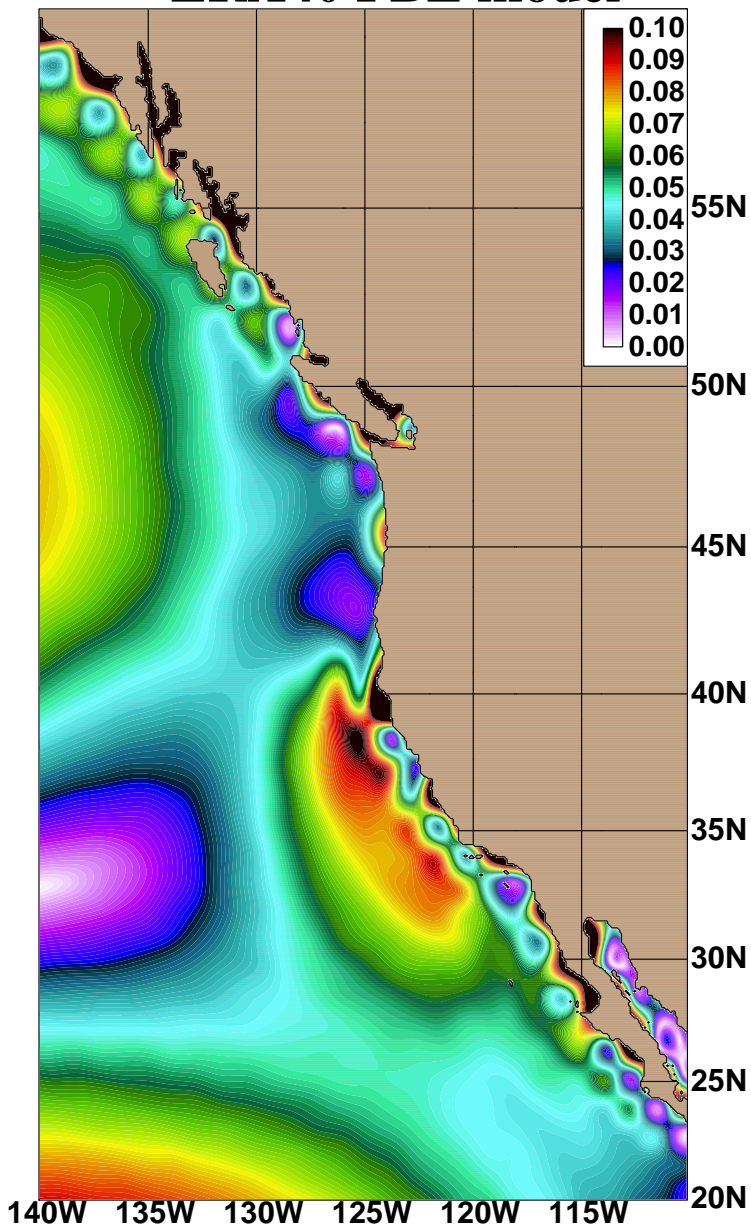


Another example: U.S. West Coast

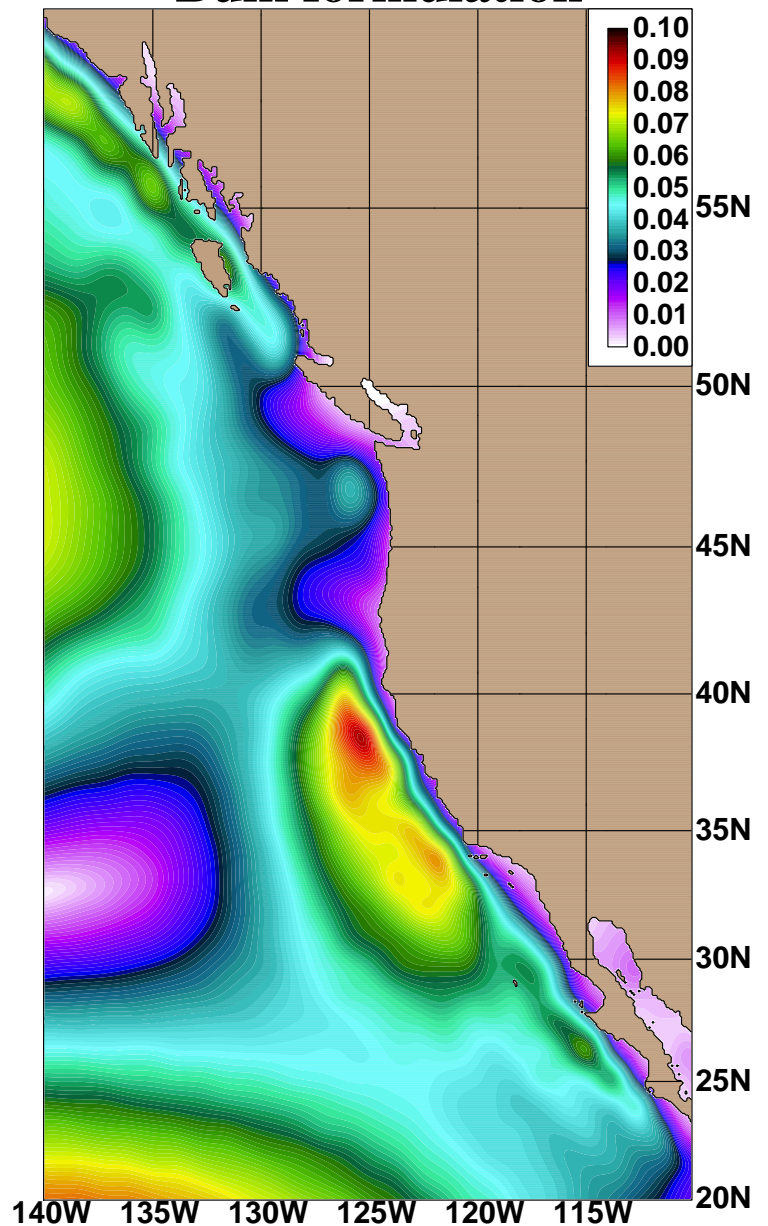
- Strong winds and upwelling near the coast

WIND STRESS MAGNITUDE (N m^{-2}): 1979–93 mean

ERA40 PBL model



Bulk formulation

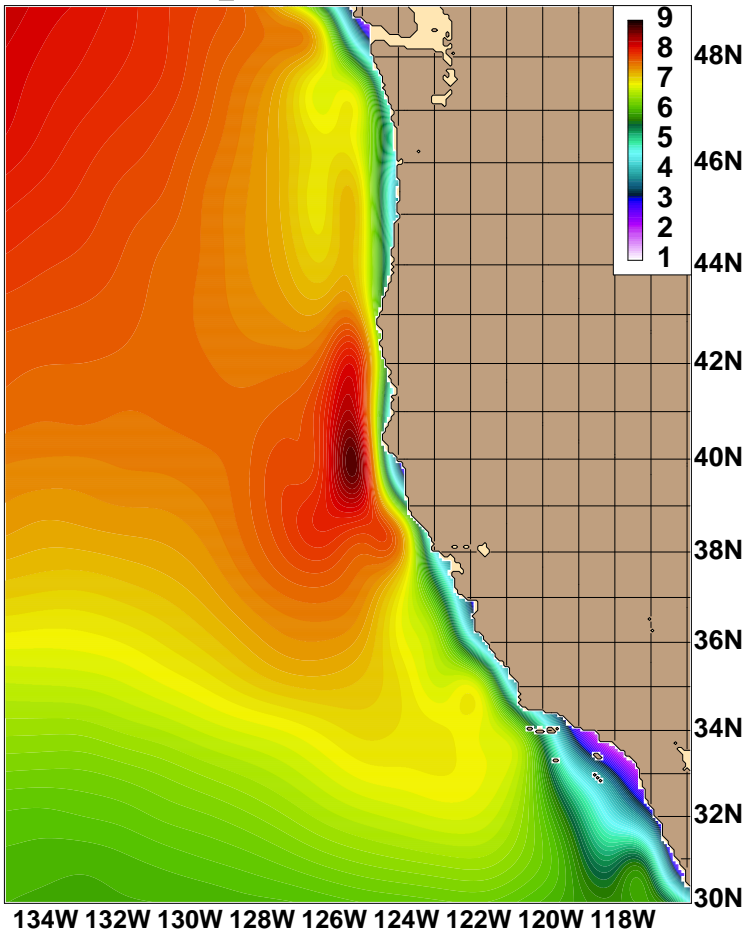


Wind Speed near the California Coast:

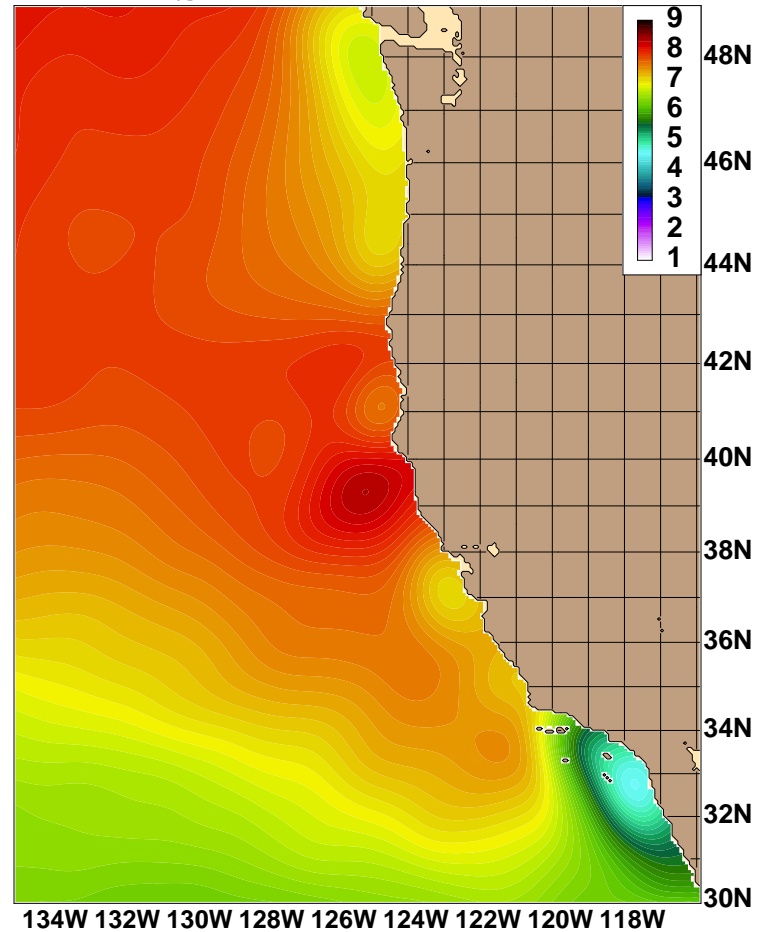
- Scatterometer wind speeds (over ocean only)

WIND SPEED (m s^{-1}): 2000–03 mean

Post-processed ERA40



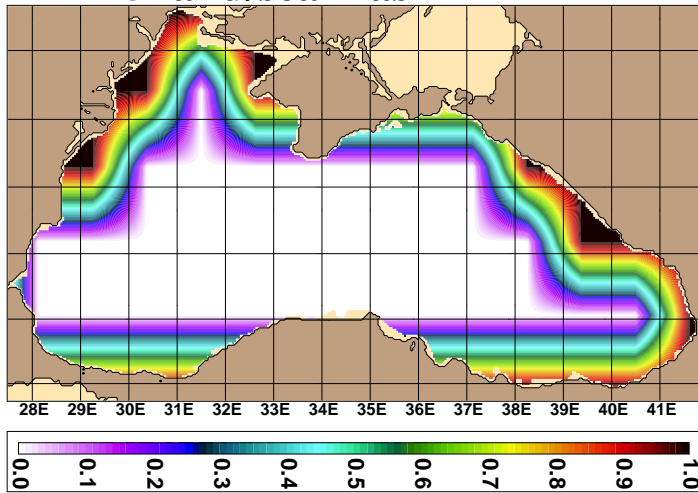
Scatterometer



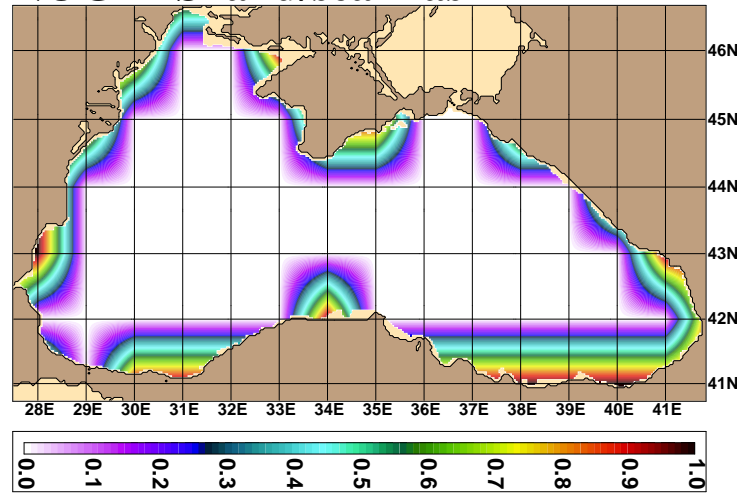
Correction for Thermal Forcing

“Creeping Land-Fill” to get rid of land-contamination

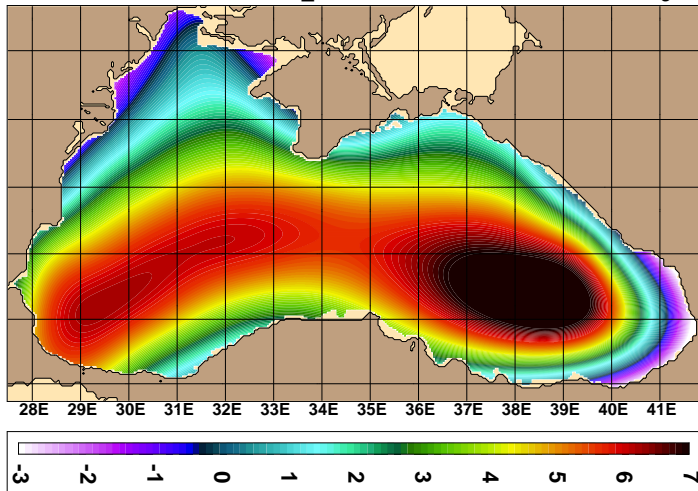
ERA15 land/sea mask



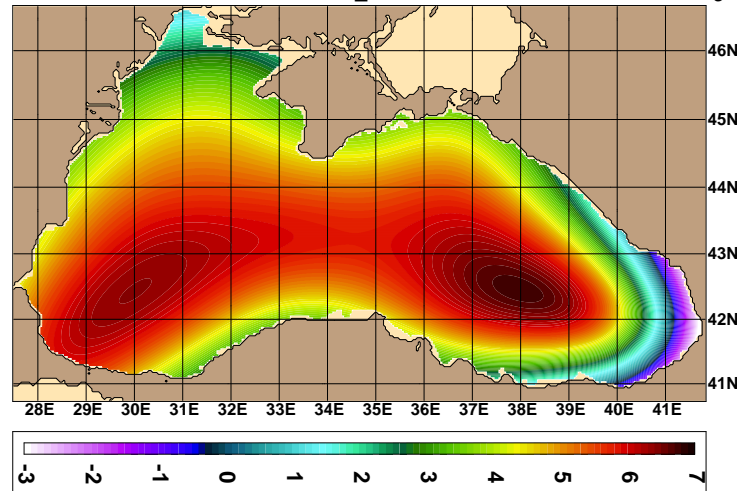
NOGAPS land/sea mask



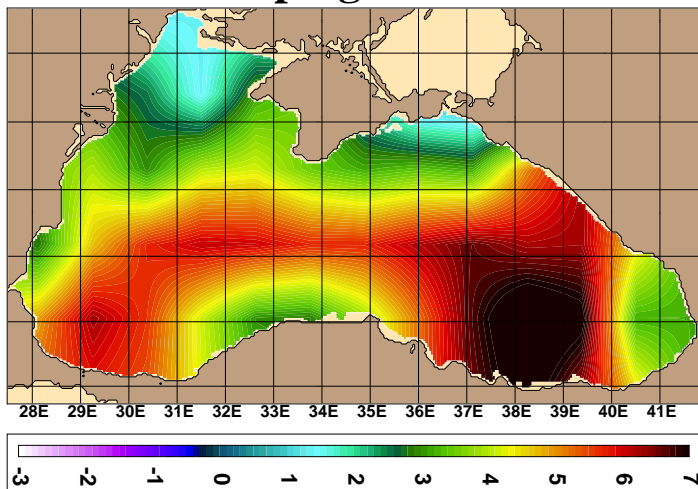
ERA15 air temp. (°C) in February



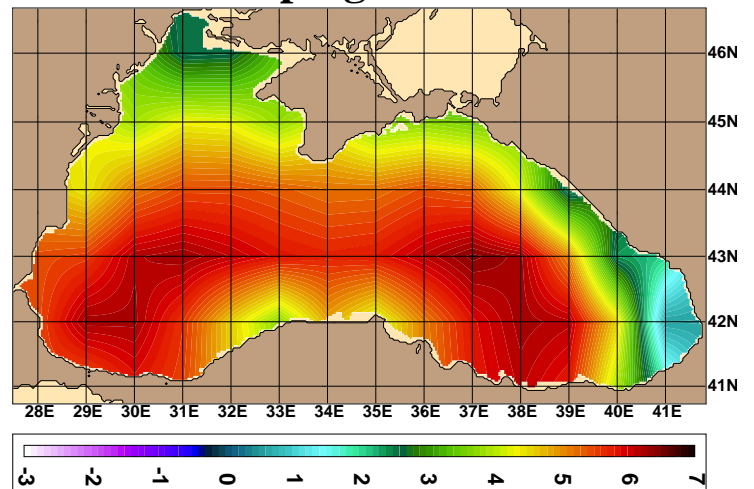
NOGAPS air temp. (°C) in February



After the creeping land-fill



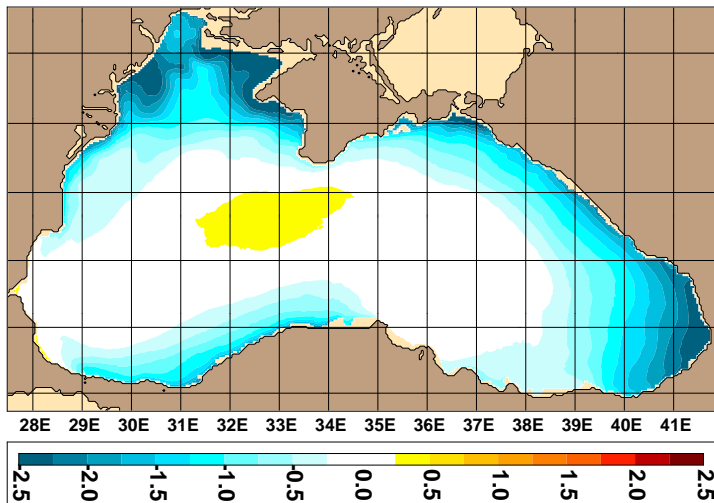
After the creeping land-fill



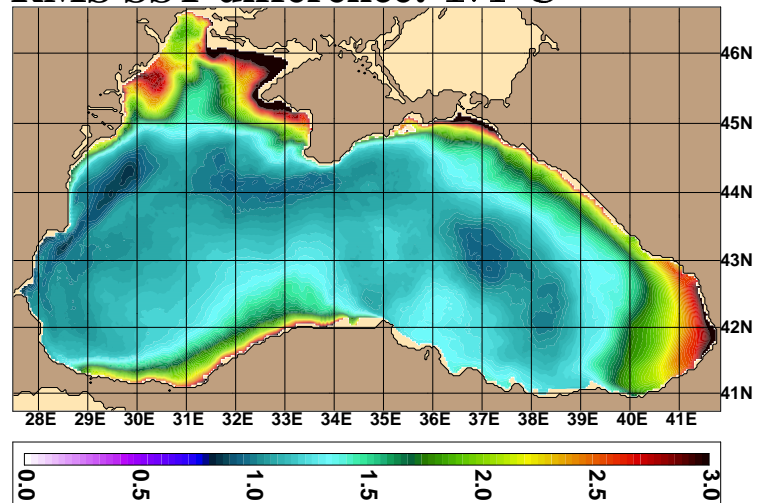
HYCOM Application

HYCOM versus Pathfinder SST climatology for seasonal cycle

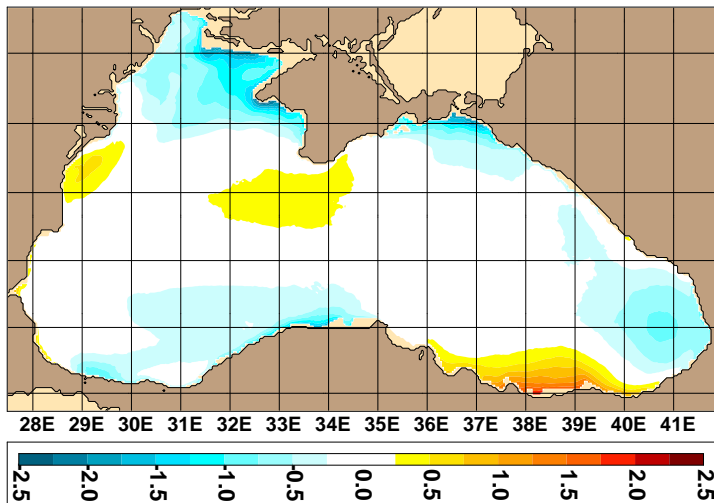
Mean SST bias: -0.6°C



RMS SST difference: 1.4°C



After the correction : -0.1°C



After the correction : 1.1°C

